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eCommerce Critical Success Factors for Chinese Enterprises: An Empirical Research on the Publishing Industry

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ABSTRACT

Critical success factor of e-commerce (EC) adoption is an important issue for developing countries. This research discusses the assessment indicators and impact factors for EC success. Combining literature review and expert investigation, four assessment indicators and ten impact factors are identified to be important for Chinese publishing companies. To test the relationship between the assessment indicators and the impact factors, data are collected form the publishing industry in China. Data analysis result shows that factors such as "establish EC strategy fitted in with company's characteristic", "share information between systems", and "manage customer relationship" are critical factors for Chinese publishing companies. This research is not only valuable for EC theory, but also important for EC practice. The findings are useful to guide the EC initiatives in China.

Keywords

E-commerce adoption, critical success factors, assessment indicators, impact factors.

INTRODUCTION

E-commerce (EC) is both opportunity and challenge to traditional companies. Only a few Chinese companies can achieve success. Most companies face many difficulties when they try to implement EC. What are the factors affecting EC success? How other companies can learn from the successful ones? These are the frequently asked questions from the companies.

At the beginning of 2000, Benbasat, Ives and Piccoli conducted a survey in ISWorld Community and got several "Electronic Commerce Top Research Questions". The result of the survey shows that "EC critical success factor (CSF)" is one of the important issues. Many researchers are now studying factors affecting EC success (Barua, Konana, Whinston and Yin, 2001; Chatterjee, Grewal and Sambamurthy, 2002; Madeja and Schoder, 2003; Molla and Licker, 2001; Zhu and Kraemer, 2002; Zhu, Xu and Dedrick, 2003). They hope to improve the successful rate of EC adoption by controlling and managing important factors. Academicians in China also begin to pay attention to this issue and put forward some factors (Qiu and Forster, 2003; Yan, 2003; Zhang and Li, 2003). But most of these studies have no data support.

This research tries to identify some indicators of EC success and some factors that influence EC in traditional companies. The indicators and factors are tested to be suitable for companies in China, and can help companies establish proper plan for EC adoption. Our research method includes exploratory and empirical studies. In the exploratory study, we gather initial indicators and factors from relevant literatures and conduct two rounds of expert surveys to identify important indicators and factors that may be suitable for Chinese companies. Furthermore we suppose that the assessment indicators are affected by the impact factors. In the empirical research, survey questionnaires are sent out to Chinese publishing companies and analyses are made to test the hypothesis.

LITERATURE REVIEW

Main Research Models Around the World

Delone and Mclean (1992) introduce a comprehensive taxonomy to present an integrated view of the concept of IS success. Many authors in the field regard Delone and Mclean's work as a major breakthrough (Molla and Licker, 2001). They validate, challenge, or propose enhancements to this model. Ten years later, Delone and Mclean (2003) propose an updated D&M IS success model and discuss the utility of the updated model for measuring e-commerce system success.

Barua et al. (2001) present a framework of electronic business value that enumerates linkages between performance drivers, operational excellence and financial metrics. They design and test a comprehensive survey instrument, and gather data from over 1000 organizations. Data provide overall empirical support for the conceptual business value model. The study shows that drivers have strong impacts on operational excellence measures and that the level of operational excellence influences financial performance.

Chatterjee et al. (2002) study the institutional enablers of the organizational assimilation of web technologies. They define web assimilation along two dimensions (dependent variables) and explain the importance of three factors (independent variables) in achieving higher levels of web assimilation. Using survey data, they prove that there is a nomological network of relationships among these independent variables and dependent variables.

Zhu and his research team have been investigating drivers of EC value resent years. One of their researches focus on the value of e-commerce in the manufacturing sector (Zhu et al., 2002). Zhu employs multiple financial measures of firm performance. He uses a composite index generated from a set of variables related to customers and suppliers. Data are collected from manufacturing companies to verify the hypotheses. Another study of Zhu is to investigate differences of EC value across country (Zhu et al., 2003). Zhu puts forward three dimensions of EC value and develops a research model for assigning the value of EC at firm level. The research gathers survey data of 612 firms across 10 countries in the financial services industry in order to testify the relationship between drivers and EC value.

Madeja and Schoder (2003) study the empirical evidence on features of corporation web pages that influence EC success. They investigate fifteen indicators of eight features of company's web site that impact corporation website success and use thirteen indicator variables to evaluate firm performance. The result shows that six web features positively impact corporation website success.

Studies in China

Since IT, IS, and EC are to support a company's strategy, the improvement of firm performance reflects the success of IT, IS and EC. The Treasury Department of China promulgates "The Performance Evaluation Indicator System of Chinese Enterprise". This system evaluates the performance of a company in qualitative and quantitative ways. Each aspect includes many indicators, such as "customer satisfaction", "proprietor quality", "gross profit rate", and "expense/ profit rate" (Meng, 2002).

The National Informatization Evaluation Center (NIEC) of China investigates the evaluation indicator system for the enterprise's informatization. This system involves six aspects: IT strategy, IT infrastructure, IT implementation, human resource, information security, and IT benefit (NIEC, 2002). NIEC used the system to evaluate and elect the "Top 500 Informationalized Companies in China" in 2003 and 2004.

Qiu and Foster (2003) discuss the situation of E-commerce application in electronics industry. They use mature degree index of e-commerce to evaluate the impact factors of e-commerce application. They inform that some aspects would affect e-commerce application in electronic industry, such as the ownership of the company, the degree of the impact by developed countries, culture, management structure, and management layer's supporting.

Other Studies

Many other researchers study the success factors of EC adoption. Cisco, IBM and PricewaterhouseCoopers (Hartman, 2000; IBM, 1999; PWC, 2000) investigate success factors of EC by their experience of consulting. Huff and Wade (2000) summarize nine success factors by case study. Weill and Vitale (2002) present eight atomic electronic commerce models and point out CSFs of each model. Saaksjarvi (1999) and Saeed, Hwang and Grover (2002) conduct empirical study to test the relationship between web features and firm performance. Motiwalla and Khan (2003), Zhuang and Lederer (2003) study EC success in the retailing industry. Some scholars study the success factors of IT (Brynjolfsson and Hitt, 2000; Lyytinen and Hirschheims, 1987), information system (Mirani and Lederer, 1998; Poon and Wagner, 2001; Shi, Chen and Jiang, 2000), ERP (Al-Mashari, 2001; Esteves and Pasto, 2000; Holland and Light, 1999; Umble, 2003; Zhong, Min and Wu, 2004) and Intranet (Tang, 2000). These researches also provide useful resources of variables and research method for our study.

Limitation of the Existing Studies

All the studies above are valuable for this study, but they have some limitations. Firstly, most of the studies focus on either assessment indicators or impact factors. There are few studies investigate on both sides and the relationship between them. Secondly, the methodology of CSF research in China is immature. There is a lack of quantitative analysis to support the conclusions (Wang, Wang and Feng, 2000). Only one empirical study of ERP success factors (Zhong et al., 2004) and two

studies of EC success factors (Qiu and Forster, 2003; Yan, 2003) can be found. Thirdly, empirical studies conducted by most of the researchers are based on data from countries other than China. Although their findings would be referenced to Chinese firms, they must be further tested.

Considering the situation of Chinese enterprises, this research uses canonical method to present general assessment indicators and impact factors of EC success. Data from Chinese enterprises are used to prove the validity of the indicators, factors and their relationships.

EXPLORATORY STUDY

Initial Variables

We suggest that the study of CSF should include two parts: one is to study assessment indicators of EC, which is to define indicators that can describe and measure EC success (we evaluate EC success from the degree that EC impacts corporation performance); the other is to study impact factors, which is to define factors that can influence EC success. The assessment indicators and impact factors can also be regarded as dependent variables and independent variables respectively in this research.

Both the qualitative and quantitative assessment indicators are gathered from "The Performance Evaluation Guideline System of Chinese Enterprise" and relevant literatures. Impact factors are also collected from existing researches, which include aspects such as leadership, strategy, management, organization, technology, customers and suppliers. Theoretical supports of the gathered variables are shown in appendix.

Exploratory Questionnaire and Survey

In order to select out the variables that are suitable for Chinese enterprises, we enquire experts' opinions by two rounds of surveys. The two rounds of questionnaires are spread to 28 experts in EC field. They are either researchers of EC/IS in universities or leaders of companies that implemented EC.

The first round questionnaire includes questions to explore the respondent's opinion of the importance of the indicators and factors gathered from relevant studies. Each item is measured on a five-point Likert scale, which represents five options respectively: "extremely important" (=5), "important" (=4), "not sure" (=3), "unimportant" (=2), "extremely unimportant" (=1). In order to better differentiate the importance of items, the second round questionnaire is measured on a seven-point scale.

All the 28 questionnaires are returned in the first round survey. Cronbach's α ranges from 0.76 to 0.87. Hence internal consistency appears to be high. Some basic statistic analyses are made. Many experts also provide some new indicators and factors from their own perspectives. We carefully analyze all theses newly raised items and assimilate some of them into the second round questionnaire. All the items in the second round survey including indicators and factors gathered from relevant studies and from experts perspectives are shown in appendix.

In the second round survey, 26 questionnaires are returned with a response rate of 92.9%. In this round, the internal consistency is also high (Cronbach's α ranges from 0.79 to 0.96). Data gathered in this survey are used to identify important indicators and factors for Chinese enterprise.

Data Analysis

Content validity ratio (CVR) is used to distill the assessment indicators and impact factors of EC success. CVR=(n-N/2)/(N/2), where n is the frequency count of the number of experts who think the item is important (expert marks the item 7 or 6) and N is the total number of experts. The CVR for each item is evaluated for statistical significance at the 0.05 level according to the table published by Lawshe. Any item that has a CVR less than 0.36 should be dropped (Lawshe, 1975). Finally we get five assessment indicators and twelve impact factors that are important for Chinese enterprises.

Hypothesis

After theoretical literature review and expert surveys, we propose a research model that consists of 12 factors that are hypothesized to have significant impact on five EC success assessment indicators. The proposed model is shown in Figure 1. The hypothesis is proposed as follow:

Hypothesis: All impact factors significantly affect EC success assessment indicators.

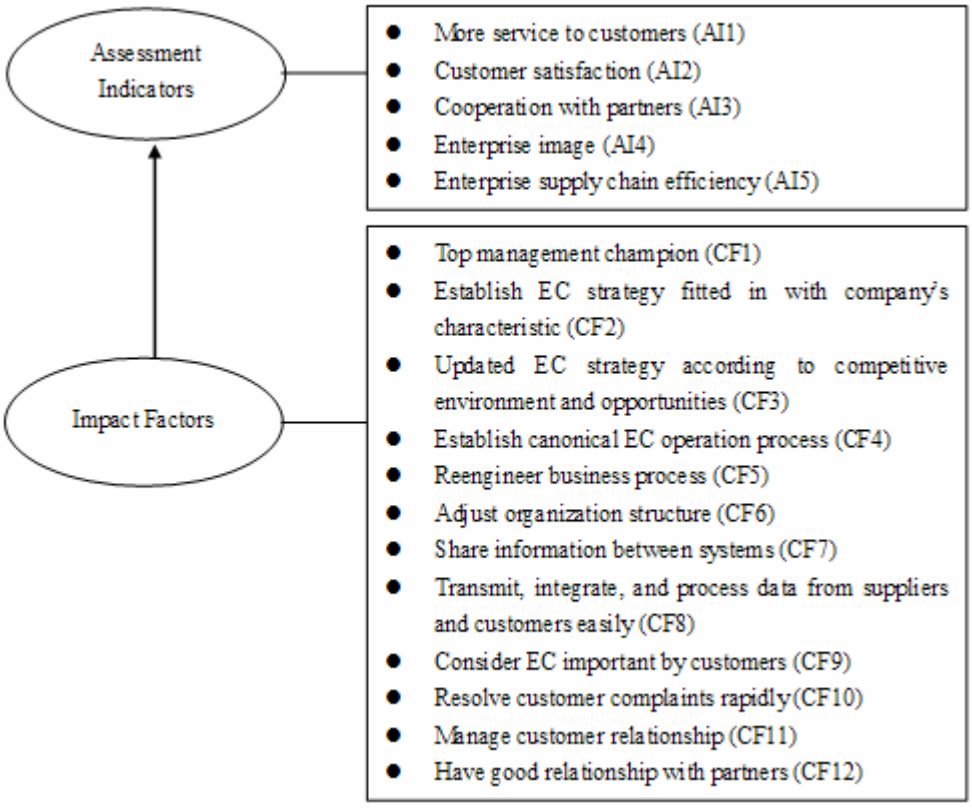

Figure 1. Research model

EMPIRICAL STUDY

Industry Background and the Revised Hypothesis

The empirical study is conducted to test the hypothesis we propose. Data are collected from companies in the publishing industry in China. We choose the publishing industry because of its high level of EC adoption. In this industry, EC is used to trade and share information and services with readers, dealers, suppliers, authors and collaborators through internet.

Before the empirical survey, the questionnaire is pilot-tested. Using the result of the pilot test, wording of certain items are changed to improve clarity and to minimize ambiguity. A more important finding is that publishing companies in China hardly use internet to make deals with their suppliers, whose level of EC adoption are still low. Therefore, we exclude some indicators and factors related to suppliers, and revise the hypothesis above. One indicator ("enterprise supply chain efficiency") and two factors ("transmit, integrate, and process data from suppliers and customers easily", "have good relationship with partners") are excluded from research model (Figure 1) and hypothesis. Four assessment indicators and ten impact factors are supposed to be important for the publishing industry in China.

Data and Sample

The final revision of the empirical questionnaire consists of three parts: the basic information of the company, four assessment indicators for EC success, and ten impact factors of EC success.

Each question that explores the companies' situation about the indicators and factors is measured on a seven-point Likert scale, ranging from "strongly accord with (=7)" to "strongly disaccord with (=1)".

From April to August 2004, we sent the questionnaires to the 305 publishing companies that had implemented EC. 93 questionnaires are returned and 84 questionnaires are useable. Statistical analysis of basis information is shown in Table 1.

	Sample	Percentage %
1. Location		
Beijing	52	61.90
Others	32	38.10
2. Percentage of IT employees		
< 1%	18	21.43
1%-5%	58	69.05
5.1%-10%	6	7.14
10.1%-15%	2	2.38
3. Website founded time		
2003	17	20.24
2002	12	13.10
2001	14	15.48
2000	17	19.05
Before 2000	24	27.38

Table 1. Statistical Analysis of Basis Information

Instrument Validity and Reliability

We calculate Cronbach's α to test reliability. Generally, if Cronbach's α is greater than 0.7, the level of factors' internal consistency is acceptable (Tang, 2000). In the empirical study, Cronbach's α ranges from 0.834~0.900, hence the internal consistency is acceptable. Since the indicators and factors are gathered by reviewing relevant literature and by two rounds of expert surveys, the content validity of the questionnaire is deemed acceptable. Furthermore we use factor analysis to test construct validity. If eigenvalue is greater than 1, cumulative explain variance is acceptable and factor loading is greater than 0.5, the construct is valid (Zhu and Kraemer, 2002; Zhuang and Lederer, 2003). All indices are acceptable in the empirical study, as reported in Table 2.

Indicators/ Factors	Loading
Assessment Indicators (Cronbach's α =0.834, eigenvalue: 2.700, cumulative explain variance: 67%)	
AI1	0.865
AI2	0.847
AI3	0.774
AI4	0.798
Impact Factors (Cronbach's α =0.900, eigenvalue: 5.333, cumulative explain variance: 53%)	
CF1	0.775
CF2	0.812
CF3	0.792
CF4	0.636
CF5	0.763
CF6	0.667
CF7	0.644
CF9	0.737
CF10	0.713
CF11	0.740

Table 2. Instrument Validation

Data Analysis

Structural equation modeling (SEM) is used to verify the relationship between independent and dependent variables by many researchers (Medeja and Schoder, 2003; Zhu et al., 2003). We also use SEM to test our hypothesis. Bentler (1989) suggests that using SEM method requires N:t>5:1. So the analysis is acceptable. The following criteria are used to assess model fit:

χ^2 / df is less than 5, RMSEA is less than 0.1, and incremental fit indices (NNFI, CFI, IFI) are greater than 0.9 (Hou, Wen and Cheng, 2004; Zhu et al., 2003).

We use LISREL 8.2 to analyze the model that includes all ten factors as independent variables. Results show that all items have positive and significant paths. But model fit indices are not acceptable.

In order to get proper model, we do many tests and finally get an acceptable one, which includes CF2, CF3, CF4, CF5, CF7, and CF10 as independent variables. Standardized paths and model-fit indices of the acceptable model are shown in Figure 2 and Table 3.

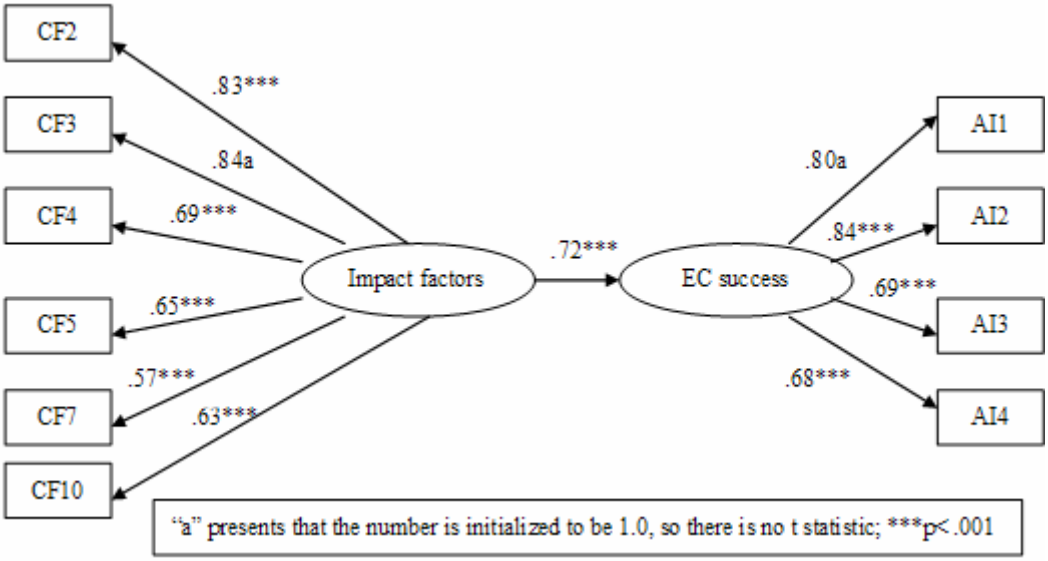

Figure 2. Standardized Paths

χ^2	df	RMSEA	NNFI	CFI	IFI
61.58	34	0.099	0.9	0.9	0.9

Table 3. Fit Indices

The results show that standardized paths are significant and this model fits well. The construct variable of factors has significant on the construct variable of indicators with the standardized path 0.72.

From the data analysis above, we can say that the hypothesis is partly supported. "More service to customers", "customer satisfaction", "cooperation with partners", and "enterprise image" are proved to be the critical assessment indicators. Impact factors including "establish EC strategy fitted in with company's characteristic", "adjust EC strategy according to competitive environment and opportunities", "establish canonical EC operation process", "reengineer business process", "share information between systems", "manage customer relationship" are proved to be the critical and have significant influence on EC success in the publishing industry.

Discussion

For the empirical study focuses on Chinese publishing industry, findings are more pertinent to the publishing industry. We discuss the critical factors we get above in more details.

- EC adoption in the publishing industry in China has just begun recent years. A suitable EC strategy is very important for an enterprise to achieve success. Furthermore, enterprises should maintain flexibility, which means they need to be ready to make radical shifts in strategy.
- Chinese publishing companies lack of experience of EC adoption. They should pay more attention to EC project operation process. Companies should use canonical method to manage their EC project.

- Business process reengineering is important for all IS implementations. This is related with the alignment between business processes and the EC model and related best practices. This process will help companies to use EC system effectively.
- Because the application level of publishing companies' internal information systems is not high, many small subsystems are not integrated and information can not be shared by departments. But the integration of internal systems and information sharing are very important for EC. The publishing companies now should integrate internal systems and share information. Only when all departments share information with each other, can enterprise provide timely service to customers.
- Chinese publishing companies are changing their strategy to customers-centered. EC is regarded as the important channel to provide information and services to customers. Therefore, how to manage customer relationship though EC is another critical problem to them.

CONCLUSION

Despite researchers' attention to EC CSFs around the world, there is few relevant empirical studies focus on it in China. This research proposes a model including both assessment indicators and impact factors based on the relevant literatures and expert investigations. Variables in the model are valid and suitable for Chinese enterprises. The significant positive relationship is found between six impact factors and four assessment indicators using the data in the publishing industry in China. This provides empirical evidence of the model and proves that the model is of practice value in China. This research expands the existing researches by discussing both dependent and independent variables and using data in the publishing industry in China to verify their relationship. The proposed model can help Chinese enterprises plan, manage, evaluate EC adoption successfully.

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APPENDIX

Theoretical Support of the Assessment Indicators and Impact Factors

Indicators	Sources
Enterprise image	Chatterjee et al., 2002; Madeja and Schoder, 2002; Saaksjarvi, 1999
Enterprise value	Delone and Mclean, 1992; Madeja and Schoder, 2002
Market share	Chatterjee et al., 2002; Delone and Mclean, 2003; Madeja and Schoder, 2002; Meng, 2002; NIEC, 2002; Rai et al., 1997; Saaksjarvi, 1999
More service to customer	Chatterjee et al., 2002; Madeja and Schoder, 2002; Mirani and Lederer, 1998; Saaksjarvi, 1999; Zhuang and Lederer 2003
Customer satisfaction	Delone and Mclean, 2003; Madeja and Schoder, 2002; Meng, 2002; Molla, 2001; Saaksjarvi, 1999; Zhu et al., 2003
Customer loyalty	Expert
Cooperation with partners	Subramaniam and Shaw, 2002; Zhu et al., 2003
Procurement quality	Expert
Current capital turnover	Meng, 2002; NIEC, 2002
Average sale revenue	Barua et al., 2001; Delone and Mclean, 2003; Madeja and Schoder, 2002; Rai et al., 1997; Zhu and Kraemer, 2002; Zhu et al., 2003; Zhuang and Lederer, 2003
Gross profit rate	Barua et al., 2001; Meng, 2002; Motiwalla and Khan, 2003; Zhu and Kraemer, 2002; Zhu et al., 2003
Expense/ Profit rate	Delone and Mclean, 1992; Meng, 2002
Marketing cost	Madeja and Schoder, 2002; Mirani and Lederer, 1998; Saaksjarvi, 1999; Zhuang and Lederer, 2003
Sales cost	Madeja and Schoder, 2002; Mirani and Lederer 1998; Saaksjarvi, 1999
Procurement cost	Mirani and Lederer, 1998; Subramaniam and Shaw, 2002; Zhu and Kraemer, 2002; Zhu et al. 2003
Procurement expense	Delone and Mclean, 2003; Meng, 2002; Motiwalla and Khan, 2003; NIEC, 2002; Subramaniam and Shaw, 2002; Zhu and Kraemer, 2002; Zhuang and Lederer, 2003
Enterprise supply chain efficiency	Mirani and Lederer, 1998; Subramaniam and Shaw, 2002; Zhu et al. 2003

Appendix Table 1. Theoretical Support of the Assessment Indicators

Comprehensive Factors	Sources
Top management champion	Al-Mashari, 2003; Chatterjee et al., 2002; Esteves and Pasto, 2000; Hartman, 2000; Holland and Light, 1999; Shi et al., 2000; Tang, 2000; Umble, 2003; Zhong et al., 2003
Establish EC strategy fitted in with company's characteristic	Al-Mashari, 2003; Hartman, 2000; Holland and Light, 1999; Poon and Wanger, 2001; PWC, 2000; Tang, 2000; Umble, 2003
Adjust EC strategy according to competitive environment and opportunities	Hartman, 2000; Huff and Wade, 2000; PWC, 2000
Have CIO management system	Expert
Set up the project team with managers from key units	Chatterjee et al., 2002; Esteves and Pasto, 2000; Hartman, 2000; PWC, 2000; Umble, 2003
Establish canonical EC operation process	Chatterjee et al., 2002; Esteves and Pasto, 2000; Hartman, 2000; Holland and Light, 1999; IBM, 1999; PWC, 2000
Input enough resource	Hartman, 2000; Shi et al., 2000; PWC, 2000
Authorize EC applications	Esteves and Pasto, 2000; Hartman, 2000; PWC, 2000
Choose proper system development partner	Al-Mashari, 2003; Esteves and Pasto, 2000
Establish fast and efficiency development process	Esteves and Pasto, 2000; Hartman, 2000; Holland and Light, 1999; IBM, 1999; Poon and Wanger, 2001; Tang, 2000
Improve perception, brand and trust	Huff and Wade, 2000; Weill and Vitale, 2001
Reengineer business process	Esteves and Pasto, 2000; Poon and Wanger, 2001; PWC, 2000; Weill and Vitale, 2001
Adjust organization structure	Al-Mashari, 2003; Esteves and Pasto, 2000; Hartman, 2000; Umble, 2003
Raise the technical level of IT staff and quality of employees	Poon and Wanger 2001; Shi et al., 2000
Infiltrate EC knowledge into business culture	Al-Mashari, 2003; Hartman, 2000; PWC, 2000
Make a fast reaction and adapt with the changes of environment	Hartman, 2000; IBM, 1999
Have an incentive structure to exert technical stuff's ability	Hartman, 2000; PWC, 2000
Enhance much of IT training	Al-Mashari, 2003; Esteves and Pasto, 2000; Holland and Light, 1999; Shi et al., 2000; Tang, 2000; Umble 2003
Keep up with new technology	PWC, 2000
Get information from intranet by employees	Barua et al., 2001; Hartman, 2000
Share information between systems	Barua et al., 2001
Integrate systems seamlessly	Al-Mashari, 2003; IBM, 1999; Tang, 2000; Zhu and Kraemer, 2002
Transmit, integrate, and process data from suppliers and customers easily	Barua et al., 2001
Consider EC important by customers	Barua et al., 2001
Disseminate customer feedback rapidly	Barua et al., 2001
Resolve customer complaints rapidly	Barua et al., 2001; Delone and Mclean, 2003
Manage customer relationship	PWC, 2000
Ensure security and privacy	Barua et al., 2001; Hartman, 2000; Huff and Wade, 2000; IBM, 1999; Molla, 2001; PWC, 2000; Tang, 2000; Weill and Vitale, 2001, Zhu and Kraemer, 2002
Have good relationship with partners	Hartman, 2000; Huff and Wade, 2000; PWC, 2000; Weill and Vitale, 2001
Consider EC important by suppliers	Barua et al., 2001
Engage in EC by suppliers	Barua et al., 2001
Establish standard operating procedures	Barua et al., 2001
Define supplier evaluation metrics	Barua et al., 2001
Define supplier quality monitoring process	Barua et al., 2001
Define information-exchange policies with suppliers	Barua et al., 2001

Appendix Table 2. Theoretical Support of the Impact Factors

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